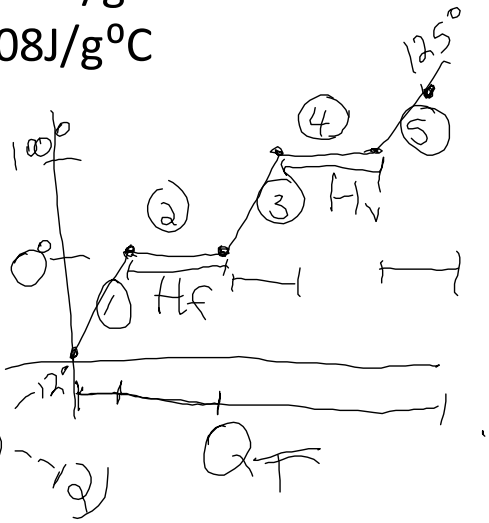
Review Questions

1) How much heat is required to change 525g of snow at -12°C to steam at 125°C?
   specific heat (solid water) = 2.11 J/g °C
   Specific heat (liquid water) = 4.184J/g°C
   Specific heat (water vapor) = 2.08J/g°C
   Heat of fusion = 335J/g
   Heat of vaporization = 2260 J/g



(1) $-12 \rightarrow 0°C$

$Q = mc\Delta T$

$= (525g)\left(2.11\frac{J}{g°C}\right)(0-(-12))$

$Q = 13293J$

(2) melts $s \rightarrow \ell$

$Q = mH_f = (525g)\left(334\frac{J}{g}\right)$

$= 175350J$

(3) $0 \rightarrow 100°C$

$Q = mc\Delta T = (525g)\left(4.184\frac{J}{g°C}\right)(100)$

$= 219660J$

(4) boil $\ell \rightarrow g$

$Q = mH_v = (525g)\left(2260\frac{J}{g}\right)$

$= 1186500J$

(5) 100 – 125°C

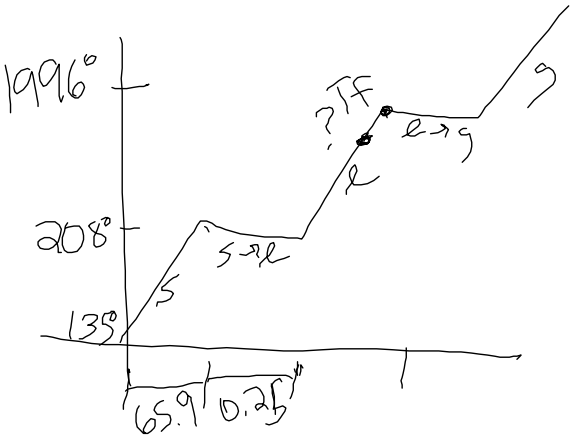
$Q = mc\Delta T = (525\,g)\left(2.08\,\frac{J}{g^\circ C}\right)(25^\circ C)$

$= 27300\,J$

$\boxed{Q_T = 1.6 \times 10^6\,J}$

1) 1250kJ of energy are added to 28.2g of Hawkium at 135°C. In what phase and at what temperature will the Hawkium be when this is complete?

Specific heat (solid)=32 J/g°C
Specific heat (liquid)=24 J/g°C
Specific heat (gas)=12 J/g°C
Heat of fusion=8.89 J/g
Heat of vaporization=36.2 J/g
BP: 1996°C MP: 208°C



① 135 → 208°C

$Q = mc\Delta T = (28.2\,g)\left(32\,\frac{J}{g^\circ C}\right)(208 - 135)$

$= 65.9\,kJ$

② melt

$Q = mH_f = (28.2\,g)\left(8.89\,\frac{J}{g}\right)$

$= 0.25\,kJ$

③ 208° → 1996°

$Q = (28.2\,g)\left(24\,\frac{J}{g^\circ}\right)(1996 - 208)$

$= 1210\ KJ$

↳ NOT enough energy for this

started 1250KJ

-65.9

$-.25$

$1184\ KJ$ ← we have this left

What is T_f?

$Q = mc\Delta T$

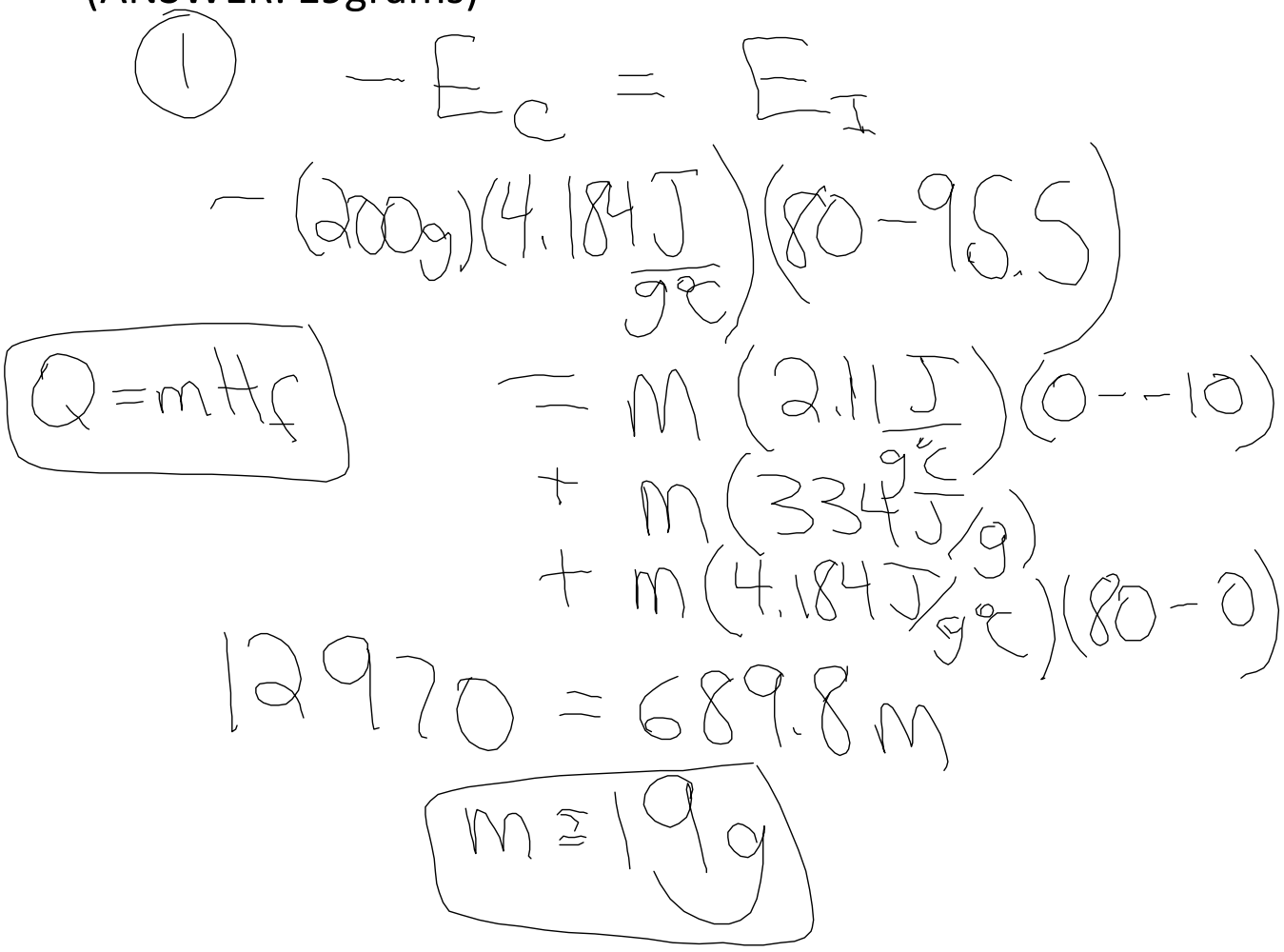
$1184kJ = (28.2g)\left(\frac{2J}{g°C}\right)(T_f - 20)$

$T_f = 1957°C$

LIQUID

1) 150 grams of water vapor at its boiling point are allowed to condense into a sample of water in a calorimeter that is at 25°C. If the final temperature of the mixture is 68°C, what was the volume of water in the calorimeter? (1 gram of water = 1 mL of water) (ANSWER:)
2) Bob likes to drink his coffee at 80.0°C. If it's too hot, Bob adds ice to the coffee to bring down the temperature. If I have a 200.0 gram cup of coffee that is 95.5°C, what mass of ice (pulled from the freezer at -10°C) should I add

to make my coffee 80.0°C? Assume the specific heat of coffee is the same as water. (ANSWER: 19grams)



3) An ice cube weighing 20 grams is removed from an ice bucket and put into an insulating cup containing 100 grams of water at 20 degrees Celsius. Will the ice cube melt completely? What will be the final temperature of the water in the cup? (ANSWER: 3.36°C)
4) How much ice could be melted by 100 grams of water at 20°C? If more than this amount of ice were present, what would the final

product be? (ANSWER: 25g)

$$Q = mc\Delta T$$

$$= (100\,g)\left(4.18\,\frac{J}{g^{\circ}C}\right)(20^{\circ}C)$$

$$Q = 8360\,J \quad \text{(available)}$$

$$Q = mH_f$$

$$8360 = m\left(335\,\frac{J}{g}\right)$$

$$\boxed{m = 25\,g}$$